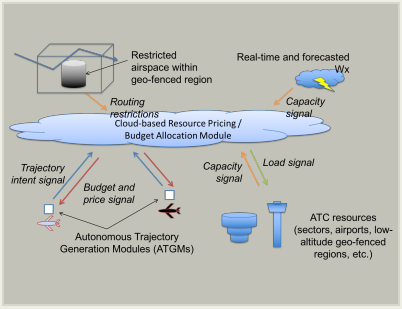
A Distributed Resilient Autonomous Framework for Manned/Unmanned Trajectory-Based Operations, Phase II

Completed Technology Project (2016 - 2018)

Project Introduction

Resilient Ops, working in collaboration with Metron Aviation, Inc., proposes to develop a prototype system for planning Unmanned Aircraft Systems (UAS) trajectories based on user intent and preference information. The system, called DRIFT-UAS (Distributed Resilient Framework for Trajectory Management of Unmanned Aircraft Systems), is intended to support autonomous Air Traffic Flow Management (ATFM) under Trajectory-Based Operations (TBO). It is composed of algorithms and information-sharing components that enable autonomous trajectory planning while optimizing system-wide objectives such as safety, efficiency, and equity. DRIFT-UAS works for a mixed environment (manned and unmanned aircraft), but special emphasis is placed on Unmanned Aircraft Systems (UAS). The immediate application is primarily targeted at lower-altitude aircraft (below 18,000 feet) but DRIFT-UAS would apply as well to upper altitudes. Using DRIFT-UAS, flight operators and air traffic management iteratively exchange trajectory intent and congestion feedback to develop trajectories that are efficient and equitable, while preserving an aircraft's autonomy in generating its own trajectories based on its internal objective tradeoffs. The feedback aspect of the DRIFT-UAS architecture separates it from other 'evaluators,' i.e., systems that check whether operating constraints are violated given a set of trajectories. Once DRIFT-UAS checks the proposed trajectories against system constraints, it provides each aircraft with information via a price update on levels of congestion and system constraints in space and time that would enable the aircraft to revise its trajectory if required. This two-way communication between aircraft and air traffic management on trajectory intent and feasibility results in better trajectories as well as clearer guidance to airspace users as to which trajectories are most likely to be available.



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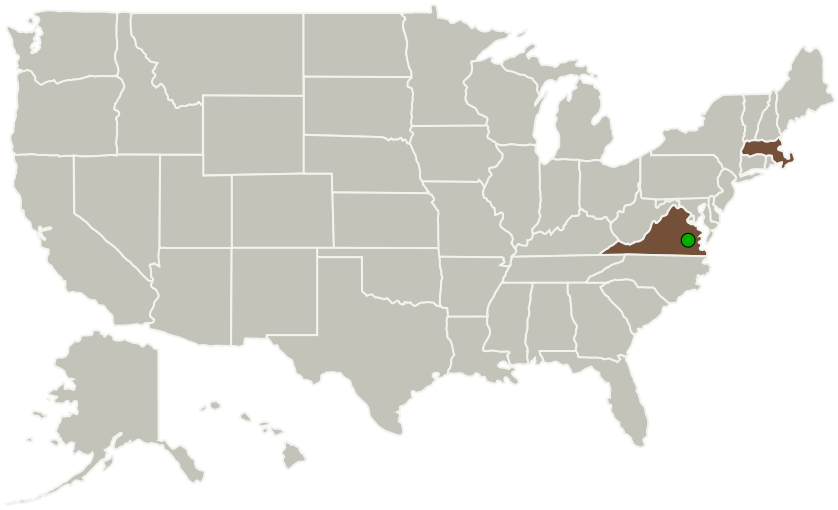
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Resilient Ops, Inc	Lead Organization	Industry	Winchester, Massachusetts
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Massachusetts	Virginia

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Resilient Ops, Inc

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

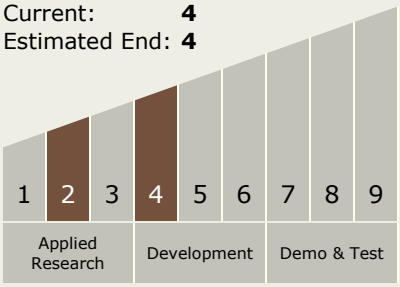
Carlos Torrez

Principal Investigator:

Bala G Chandran

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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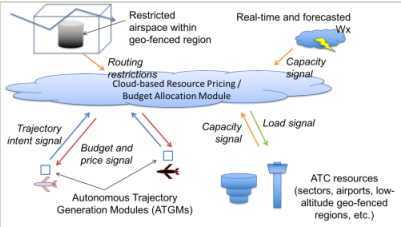
Images



Briefing Chart Image
A Distributed Resilient Autonomous Framework for Manned/Unmanned Trajectory-Based Operations, Phase II
(https://techport.nasa.gov/image/135641)

Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.5 Revolutionary Communications Technologies
    - TX05.5.2 Quantum Communications

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System